National Institute of Environmental Health Sciences

Evaluating a system of systems approach for integrated global weather, climate, hazard monitoring

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Abstract:

Industry supports the government in developing, deploying, and operating Earth observation systems used to ensure national security. These systems provide essential science data used in real-time detection of weather, forecasting of long-term climate change, and monitoring of hazards. Science communities for weather, climate and hazards have established target sets of essential observables. The results of an assessment of the capacity of current and planned systems to provide these essential variables is described. An approach for a future Earth observation system architecture that integrates data collected from geostationary and polar-orbiting satellites with Unmanned Aerial System (UAS) platforms is formulated. This approach includes configuring operational environmental monitoring satellites, NPOESS and GOES R, augmented by UAS vehicles such as the Global Hawk with complementary modeling and decision support system. The candidate architecture has the capacity to deliver innovative environmental data collection capabilities over a range of environmental conditions, including such severe hazards as hurricanes and extreme wildland fires. A set of metrics that includes sustainability, interoperability, and capacity to contribute to science data products are introduced to evaluate the approach. The performance of the current and planned systems configurations are evaluated against several factors that include long term capacity for measuring essential climate variables (ECVs), environmental data records (EDRs), and solid Earth hazard parameters. Seven dimensions of an Enterprise approach for a sustainable, global capacity are presented. Emphasis is given to achieving enhancements to capacity to measure global changes associated with climate, deliver well-calibrated and validated data for weather forecasting, and capacity to effectively deliver timely information associated with a range of hazards. An approach to formulating an enterprise architecture that brings together space and airborne systems with ground and ocean observing sensors as a vertically integrated global observing system for climate-related measurements and determination of uncertainties is described.

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Resource Description

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☑

audience to whom the resource is directed

Public

Early Warning System: ☑

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure : ☑

weather or climate related pathway by which climate change affects health

Extreme Weather Event

Extreme Weather Event: Hurricanes/Cyclones, Wildfires

Geographic Feature: ☑

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☑

resource focuses on specific location

Global or Unspecified

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Intervention: ☑

strategy to prepare for or reduce the impact of climate change on health

A focus of content

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Short-Term (